REMARKS

Status of Claims:

Claims 1-12 are present for examination.

Allowable Subject Matter:

Applicant expresses appreciation to the Examiner for the indication that claims 3-6 and 9-12 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

Obviousness Rejections:

Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oda (U.S. Patent Number 6,628,698) in view of Popovic et al (U.S. Patent Number 6,370,397) (hereinafter Popovic).

Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oda in view of Popovic, and further in view of Watanabe (U.S. Patent Number 6,044,104).

With respect to claims 1-2 and 7-8, as amended, the rejections are respectfully traversed.

Independent claim 1, as amended, recites a receiver of a spread spectrum communication system comprising:

"a plurality of despreading circuits for despreading received signals having multipath components at predetermined timing allocated thereto;

a rake circuit for performing rake combining of the signals despread by despreading circuits; and

a path searcher which forms a first window showing a part of a search range and calculates delay profile data of said received signals in said first window to search an effective path, forms at least one second window in the search range other than said first window and calculates delay profile data of said received signals in said second window, and detects timing at which said received signals are despread based on calculated delay profile data to allocate the detected timing to said despreading circuits." (Emphasis Added)

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A receiver of a spread spectrum communication system including the above-quoted features has the advantage that a path searcher divides a search range into at least <u>two windows</u>, calculates delay profile data in each of the windows <u>individually</u>, and then detects timing at which said received signals are to be despread based on the calculated delay profile data. By dividing a search range into at least <u>two windows</u>, the receiver including the above-quoted features does <u>not</u> have to search for <u>all</u> sample points in a <u>single</u> window for an entire search range and, thus, a <u>number of correlators</u> that need to operate <u>concurrently</u> can be <u>reduced</u>. By reducing the number of correlators that need to operate concurrently, it is possible to attain <u>miniaturization</u> of the receiver and realize a <u>reduction</u> in consumption <u>power</u>. Also, by calculating the delay profile data in each window separately, an <u>amount of information</u> to be <u>stored</u> at a time during calculation of the correlation values can be <u>reduced</u> and, thus, a required <u>storage quantity</u> can be <u>reduced</u>. (Specification; page 2, line 3 to page 3, line 2; page 5, lines 14-25; page 7, line 24 to page 9, line 4; page 10, lines 5-11).

Neither Oda nor Popovic, alone or in combination, disclose or suggest a receiver of a spread spectrum communication system including the above-quoted features. The Examiner recognizes that while Oda discloses the use of a <u>single</u> window, Oda is <u>silent</u> regarding forming a <u>second window</u> in a search range. For that teaching, the Examiner looks to Popovic, and the Examiner states that Popovic "forms at least one <u>second window</u> in the search range ... (col. 7, lines 10-20, 40-60; col. 8, lines 26-34)." (Emphasis Added).

However, Popovic only teaches the use of a <u>single</u> window. In Popovic, <u>a</u> search window defines <u>a</u> delay profile that contains plural paths of a received signal. (Popovic; abstract). Popovic then calculates a mean delay of a channel impulse response (CIR) and <u>adjusts</u> the <u>single</u> search window so that a <u>center</u> of the search window and the <u>mean CIR delay</u> are <u>aligned</u>. (Popovic; abstract). As shown in FIG. 3 of Popovic, the system of Popovic only has a <u>single search window</u> for <u>all</u> delay values. (Popovic; FIG. 3, reference Search Window). Indeed, Popovic states that "the <u>length</u> of <u>the</u> search window is <u>sufficient to fully encompass</u> the channel impulse response (<u>all</u> of the <u>significant multipaths</u> of the received signal) <u>plus</u> an additional offset so that the window is <u>somewhat wider</u> than the portion of the channel impulse response <u>containing valid multipaths</u>." (Popovic; column 5, lines 36-50) (Emphasis Added). Thus, the system of Popovic only has <u>one</u> search window.

When Popovic refers to "adjusting" the search window, the "adjustment" refers to aligning a center of the single search window with a mean CIR delay. (Popovic; abstract; FIG. 12, references 130, 136; FIG. 13, reference 154; column 2, lines 29-47). Thus, the window tracking unit of Popovic adjusts a <u>position</u> of the <u>single</u> search window, and the system of Popovic does <u>not</u> have a <u>second</u> window.

The Examiner points to Popovic (col. 7, lines 10-20, 40-60; col. 8, lines 26-34) as disclosing a second window. However, applicant can find no discussion or suggestion of a <u>second</u> window in Popovic (col. 7, lines 10-20, 40-60; col. 8, lines 26-34).

Popovic, column 7, lines 10-20 states the following:

> "Assuming that initial synchronization is acquired, reference is now made to the multipath search processor 60 illustrated in additional detail in FIG. 6. The signal received by each automatic gain control unit corresponds to the signal transmitted by the mobile station. Each of the automatic gain control circuits 52 is connected to base station selector 62 which selects blocks of signal samples from both antenna signals from each base station sector. Again, while sectors and antenna diversity are employed in this example embodiment, it is understood that the present invention is not restricted to antenna diversity or to base stations with sectors."

Popovic, column 7, lines 40-60 states the following:

> "... signals to be demodulated in the RAKE demodulator 54. The corresponding path delays and powers of the N paths selected by the path selection unit 66 are provided to a window tracking unit 70. The number N of selected paths should be equal to the number of RAKE fingers, but N can also be smaller if there are not enough paths with powers above the detection threshold. These selected paths form a selected channel impulse response as defined above. <u>The main function of the window tracking unit 70 is to keep the multipath channel impulse response in the middle of the search window</u>. <u>The</u> search window <u>position</u> is corrected using a search window <u>position correction</u> signal from the window tracking unit 70 provided to the timing control block 56. By adjusting the phase, i.e., the state of the PN generators which is applied to the channel estimator 64, <u>the</u> search window is effectively <u>adjusted</u>. Another function of the window tracking unit 70 is to adapt the selected path delays .tau..sub.1 ', . . . , .tau..sub.N ' in accordance with <u>the</u> search window <u>adjustments</u>. A chip synchronization unit 68 determines whether an initial synchronization process is completed, and if so, sets a chip sync flag. The chip synchronization unit 68 ..." (Emphasis Added).

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Finally, Popovic, column 8, lines 26-34 states the following:

> "The structure of each of the M parallel channel estimators 64 is shown in FIG. 8. The demultiplexed and buffered signal from corresponding pilot demultiplexer buffer 76 is correlated in a de-spreader 80 with the known, complex PN.sub.1 /PN.sub.Q de-spreading code (the pilot sequence) to generate a complex correlation vector thereafter multiplied by a scaling factor in multiplier 82 which depends on the automatic gain control amount. FIG. 9 shows in more detail the de-spreader 80. The input complex signal is down-sampled ..."

In the above-extracted paragraphs from Popovic, there is only a reference to a <u>single</u> search window. Popovic discusses how to <u>adjust</u> a <u>position</u> of the <u>single</u> search window to <u>center</u> the search window with a channel impulse response, but <u>never</u> discloses or suggests a <u>second</u> search window.

Therefore, independent claim 1, as amended, is neither disclosed nor suggested by the cited prior art and, hence, is believed to be allowable.

Dependent claim 2 recites the receiver of the spread spectrum communication system according to claim 1,

> "wherein said path searcher forms <u>a plurality of second windows</u> by dividing the search range except said first window to calculate said delay profile data in said respective second windows <u>in accordance with a predetermined order</u>." (Emphasis Added).

Neither Oda, Popovic, nor Watanabe, alone or in combination, disclose or suggest a receiver including the above-quoted features. The Examiner recognizes that Oda and Popovic do not disclose a path searcher forming a plurality of second windows by dividing a search range to calculate delay profile data in respective second windows in accordance with a predetermined order. For this teaching, the Examiner looks to Watanabe as disclosing a cell search apparatus with a path searcher that "forms a plurality of second windows by dividing the search range to calculate delay profile data in respective second windows in accordance with a predetermined order (col. 3, lines 39-67; col. 4, lines 8-17)."

However, the apparatus of Watanabe does <u>not</u> include a path searcher for forming <u>a</u> <u>plurality of second windows</u>, and does <u>not</u> calculate delay profile data in respective second

windows <u>in accordance with a predefined order</u>. The apparatus of Watanabe only defines a <u>single</u> search window. (Watanabe; abstract; FIG. 2, reference Search Window Width). Then, Watanabe assigns correlators to perform correlative detection for different search widths of the <u>single</u> search window. (Watanabe; column 2, lines 58-63; column 4, lines 8-17). In the apparatus of Watanabe, each correlator <u>simultaneously</u> carries out correlative detection within the <u>single</u> search window. (Watanabe; column 2, lines 58-67). Since the correlators in the apparatus of Watanabe perform correlative detection simultaneously for a <u>single</u> search window, they do not calculate delay profile data in respective <u>second</u> windows <u>in accordance with a predetermined order</u>.

As stated in Applicants' specification, one of the problems created by having only a <u>single</u> search window is that the correlators at <u>all</u> sample points must be operated simultaneously, which causes power consumption to increase. (Applicants' specification; page 2, lines 11-13). The receiver including the above-quoted features addresses such a problem by having a plurality of second windows and calculating delay profile data in respective second windows <u>in accordance with a predetermined order</u>.

Therefore, dependent claim 2 is neither disclosed nor suggested by the cited prior art and, hence, is believed to be allowable.

Independent claim 7 recites a path search method of a spread spectrum communication system with similar features as features of the receiver of a spread spectrum communication system of independent claim 1. Therefore, independent claim 7 is believed to be allowable for at least the same reasons that independent claim 1 is believed to be allowable.

Dependent claim 8 recites a path search method with similar features as features of the receiver of claim 2. Therefore, claim 8 is believed to be allowable for at least the same reasons that claim 2 is believed to be allowable.

The dependent claims are deemed allowable for at least the same reasons indicated above with regard to the independent claims from which they depend.

Conclusion:

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.
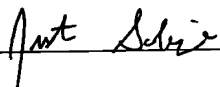
The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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